

# Product Document



## User Guide

UG000498

# TMD2712

## TMD2712 EVM

## ALS and Proximity Sensor Module

v1-00 • 2020-Aug-12

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# Content Guide

<b>1</b>	<b>Introduction.....</b>	<b>3</b>	4.5	Device ID Information .....	10
1.1	Kit Contents.....	3	4.6	Log Status and Control Information .....	10
1.2	Ordering Information .....	3	4.7	“ALS” Tab.....	11
<b>2</b>	<b>Getting Started.....</b>	<b>4</b>	4.8	“Prox” Tab .....	13
<b>3</b>	<b>Hardware Description.....</b>	<b>5</b>	<b>5</b>	<b>Resources .....</b>	<b>17</b>
<b>4</b>	<b>Software Description.....</b>	<b>6</b>	<b>6</b>	<b>Revision Information.....</b>	<b>18</b>
4.1	Connect Software to Hardware .....	6	<b>7</b>	<b>Legal Information .....</b>	<b>19</b>
4.2	System Menus.....	7			
4.3	System Level Controls .....	9			
4.4	Auto Polling .....	9			

# 1 Introduction

The TMD2712 evaluation kit comes with everything needed to evaluate the TMD2712. The device features proximity detection and digital ambient light sensing (ALS).

## 1.1 Kit Contents

**Figure 1:**  
Evaluation Kit Contents



No.	Item	Description
1	TMD2712 Daughter Card	PCB with TMD2712 sensor installed
2	EVM Controller Board	Used to communicate USB to I2C
3	USB Cable (A to Mini-B)	Connects EVM controller to PC
4	Flash Drive	Include application installer and documents

## 1.2 Ordering Information

Ordering Code	Description
TMD2712 EVM	TMD2712 ALS and Proximity Sensor Module

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## 2 Getting Started

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The software should be installed prior to connecting any hardware to the computer. Follow the instructions found in the Quick Start Guide (QSG). This loads the required driver for the USB interface and the device's graphical user interface (GUI).

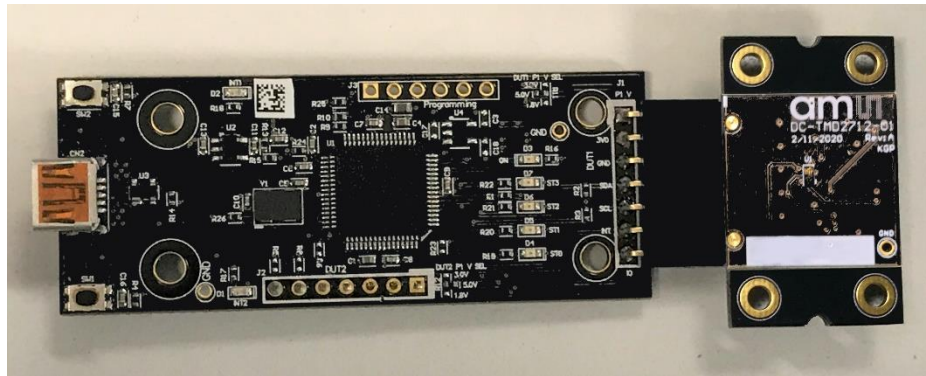
The balance of this document identifies and describes the controls available on the GUI. In combination with the TMD2712 datasheet, the QSG and application notes available on the **ams** website, [www.ams.com](http://www.ams.com), there should be enough information to allow evaluation of the TMD2712 device.

## 3 Hardware Description

The hardware consists of the EVM Controller, the TMD2712 EVM daughter card, and a USB interface cable. The EVM controller board provides power and I2C communication to the daughter card through a seven-pin connector. When the EVM controller is connected to the PC through USB, a green LED on the board flashes once on power up to indicate the system is getting power.

For schematics, layout and BOM information please see the documents included with the install located in the TMD2712 EVM folder (All Programs -> ams -> TMD2712 EVM -> Documents).

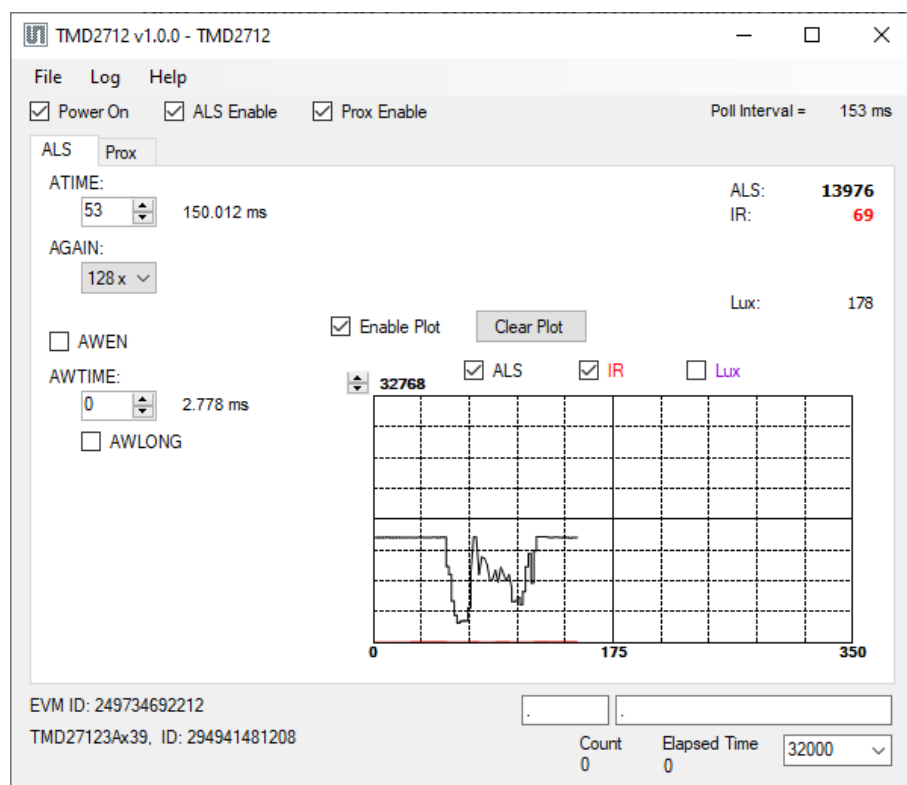
**Figure 2:**  
Evaluation Kit Hardware



## 4 Software Description

The main window (Figure 3) contains the system menus, system level controls, device information and logging status. The ALS tab contains controls for the light sensing function and the Prox tab contains settings for the proximity function. The application polls the ALS and proximity raw data continuously and calculates the Lux values and prox standard deviation values.

Figure 3:  
GUI Main Window



### 4.1 Connect Software to Hardware

On startup, the software automatically connects to the hardware. On successful initialization, the software displays a main window, containing controls pertinent to the connected device. If the software detects an error, an error window appears. If “Device not found or is unsupported” appears, verify the correct daughterboard is properly connected to the EVM controller board. If “Cannot connect to EVM board” appears, verify the USB cable is connected. When the EVM controller board is connected to the USB, a green LED on the board flashes once on power up to indicate the USB cable is connected and providing power to the system.

If the EVM board disconnects from the USB bus while the program is running, it displays an error message and then terminates. Reconnect the EVM board and restart the program.

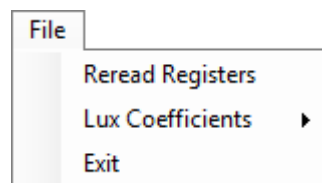
## 4.2 System Menus

At the top of the window there are pull-down menus labeled “File”, “Log”, and “Help”. The **File** menu provides basic application-level control. The **Log** menu controls the logging function, and the **Help** menu provides version and copyright information for the application.

### 4.2.1 File Menu

The File menu contains the following functions:

**Figure 4:**  
**File Menu**



The **Reread Registers** function forces the program to re-read all of the control registers from the device and display them on the screen. This does not read the output data, because the program reads those registers continually while it is running.

The **Lux Coefficients** menu allows the user to Display, Load or Save the lux coefficients used to calculate lux. See ALS Lux Coefficients section for more details.

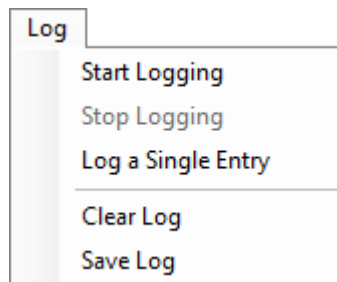
Click on the **Exit** command to close the main window and terminate the application. Any unsaved log data is cleared from memory. The application can also be close by clicking the red “X” in the upper right hand corner.

### 4.2.2 Log Menu

The Log menu controls the logging function and saves the log data to a file. Log data accumulates in memory until discarded or written to a data file.



**Figure 5:**  
**Log Menu**



Click **Start Logging** to start the logging function. Each time the program polls the output information from the device, it creates a new log entry showing the raw data values, the values of various control registers, and the values entered by the user into the text fields near the bottom right corner of the window.

Click **Stop Logging** to stop the logging function. Once logging stops, the user may store the data in a file, or continue collecting additional data by clicking **Start Logging** again.

The **Log a Single Entry** command causes logging to start, collect one single entry, and immediately stop again. This function is not available when logging is already running.

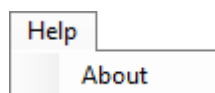
Click **Clear Log** to discard any previously collected data. If there is data in memory, which has not been saved to disk, this function displays a prompt asking to verify it is OK to discard the data. If the log is active when this function executes, the log continues running after the existing data is discarded.

Click **Save Log** to save the collected log data to a csv file. This stops the logging function, if it is active, and displays a file dialog box to specify where to store the logged data. The Log Status and Control Information section below describes the default file name, but you may change the file name if desired.

### 4.2.3 Help Menu

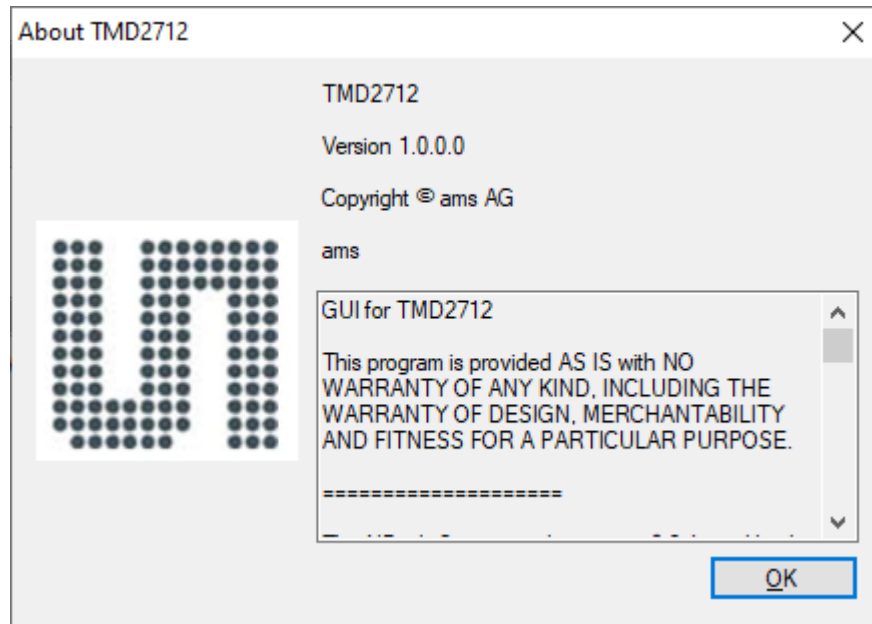
The Help menu contains a single function: About.

**Figure 6:**  
**Help Menu**



The **About** function displays a dialog box (Figure 7) showing the version and copyright information for the application and library. Click the **OK** button to close this window and continue.

Figure 7:  
About Window



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## 4.3 System Level Controls

Immediately below the top menu bar there are checkboxes used to control the system level functions of the TMD2712 device.

The **Power On** checkbox controls the PON function of the TMD2712. When this box is checked, the power is on and the device can operate. When this box is unchecked, the power is off and the device does not operate (You can still change the control registers, but the device does not perform ALS and Prox functions).

The **ALS Enable** checkbox controls the AEN function of the TMD2712. When this box is checked, the device collects and report ALS data as programmed. When this box is unchecked, the ALS function does not operate.

The **Prox Enable** checkbox controls the PEN function of the TMD2712. Proximity detection is enabled when this box is checked or disabled when unchecked.

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## 4.4 Auto Polling

The application automatically polls the TMD2712 raw data of ALS and Prox if enabled. The **Poll Interval** displays the time between reads of the device.

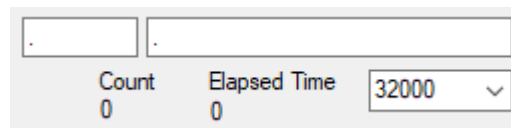
## 4.5 Device ID Information

The lower left corner of the window displays the ID number of the EVM Controller board, identifies the device being used and displays the ID of the device.

## 4.6 Log Status and Control Information

The lower right corner of the window contains status information and controls for the logging function:

**Figure 8:**  
**Logging Status**



.	.	
Count	Elapsed Time	32000
0	0	▼

This section contains text boxes that are stored in the log file data and used to build the file name for the log file. If the data in these fields are changed, the new values are stored with any new data logged. The default file name is based on these values at the time the log file is written. If nothing is entered in these boxes they default to a period (“.”).

**Sample default file name:**

TMD2712\_1-2-3\_Log\_HH\_MM\_SS.csv

■ From Application

■ From User Input

The **Count** value displayed is a count of the number of samples currently in the log buffer.

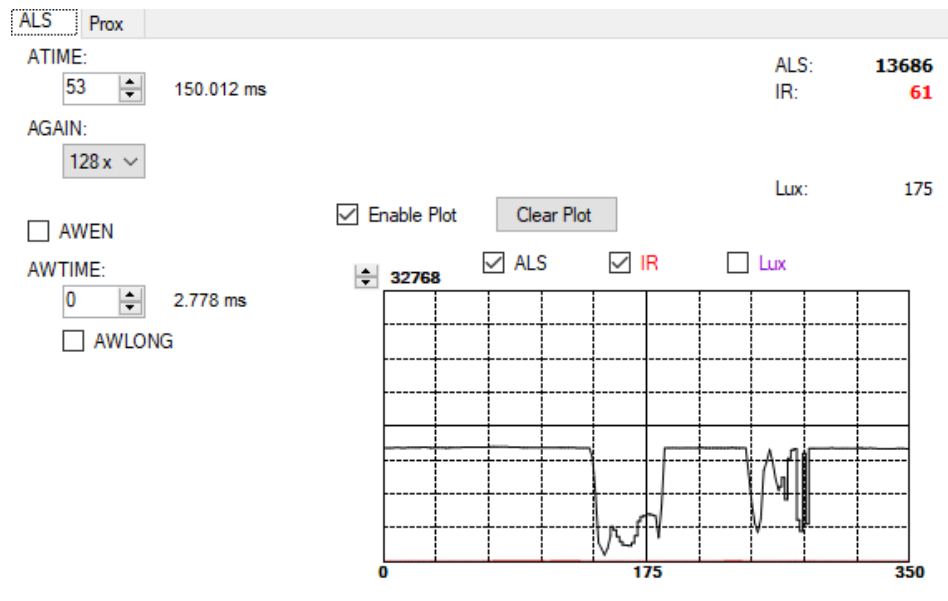
The **Elapsed Time** value indicates the elapsed time since data logging started.

The numeric box in the bottom right-hand corner sets a limit to the size of the collected dataset. You may select a value from the pull-down list, or enter a value manually. When the number of entries in the log reaches this value, the program will automatically stop logging and display a file dialog box to specify where to store the logged data. You may change the file name if desired. The maximum value that may be entered in this field is 32000.

## 4.7 “ALS” Tab

The main portion of the screen contains a tab labeled ALS. The controls in this tab are divided into 3 sections, each performing a separate function.

Figure 9 :  
ALS Tab



### 4.7.1 ALS Controls

The left side of the ALS tab contains controls to set various ALS settings.

The **ATIME** control sets the time of the ALS integration. ATIME can be adjusted in 2.778ms steps.

The **AGAIN** control is a pulldown menu which sets the analog gain of the ALS sensor. The values available are 16x, 128x and 1024x.

The **AWEN** checkbox controls the ALS Wait feature. When this box is checked, the values for WTIME and WLONG determine the time between ALS cycles. When this box is unchecked, there is no wait period between ALS cycles and the values of AWTIME and AWLONG are ignored.

The **AWTIME** control sets the time to wait between ALS cycles. AWTIME can be adjusted in 2.778ms steps.

The **AWLONG** checkbox controls the AWTIME factor. When this box is checked, the wait time between ALS cycles increases by a factor of 12x.

## 4.7.2 ALS Lux Coefficients

The TMD2712 supplies information that is used to calculate Lux (unit of illumination). The Lux equation for the TMD2712 uses a combination of data from the sensor and various coefficients to calculate the Lux value. The software is pre-configured with coefficients for an open-air configuration. When the sensor is placed behind glass, different coefficients should be loaded into the software to update the Lux equation. The coefficients can be loaded or saved to an XML file using the File menu. To ensure the proper XML format first save the current coefficients using **File > Lux Coefficients > Save**. Once the file is saved, locate the XML file created and edit with a text editor such as notepad to change the coefficients. Then go to **File > Lux Coefficients > Load** and select the XML file that was updated.

The software can also automatically load new coefficients upon starting the GUI. To do this save the XML file as **TMD2712\_luxeq.xml** in the system documents directory (**%USERPROFILE%\Documents**, also known as **My Documents**). Then restart the GUI and see a dialog appear with the new coefficients displayed.

If you are experiencing trouble loading new coefficients, this may indicate a problem with the file format. The XML file must contain all the required Lux equation elements to be loaded. The format of the file follows the standard XML format and is as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Device:TMD2712 Saved:5/11/2020 1:55:32 PM -->
<luxeq>
  <eq_values>
    <coef value="246.743" name="DGF"/>
    <coef value="1.622" name="CoefB"/>
    <coef value="0.888" name="CoefC"/>
    <coef value="1.117" name="CoefD"/>
  </eq_values>
</luxeq>
```

## 4.7.3 ALS Output Data

The top right corner of the ALS tab displays the output data. This data is continuously read. The polling interval is shown above the tab.

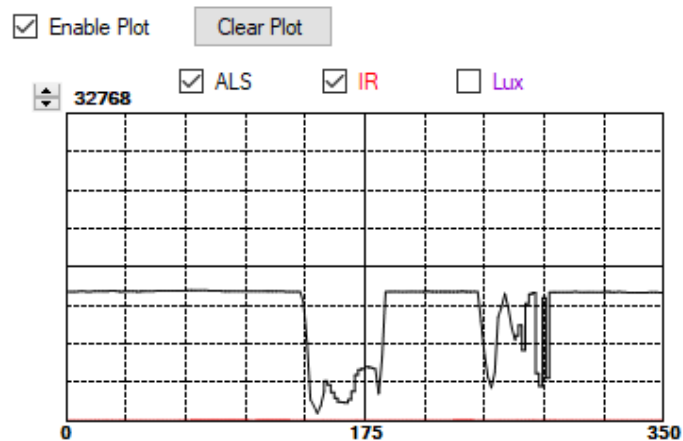
- **ALS** displays the Visible Light Channel data count.
- **IR** displays the IR Channel data count.
- **Lux** displays the calculated lux.

## 4.7.4 ALS Data Plot

The remaining portion of the ALS tab is used to display a running plot of the collected ALS values and calculated Lux. The last 350 values are collected and plotted on the graph. As additional values are

added, the old values will be deleted from the left side of the graph. To start the plotting function, check the **Enable Plot** checkbox and select the **ALS**, **IR**, or **Lux** checkboxes.

**Figure 10:**  
**ALS Data Plot**



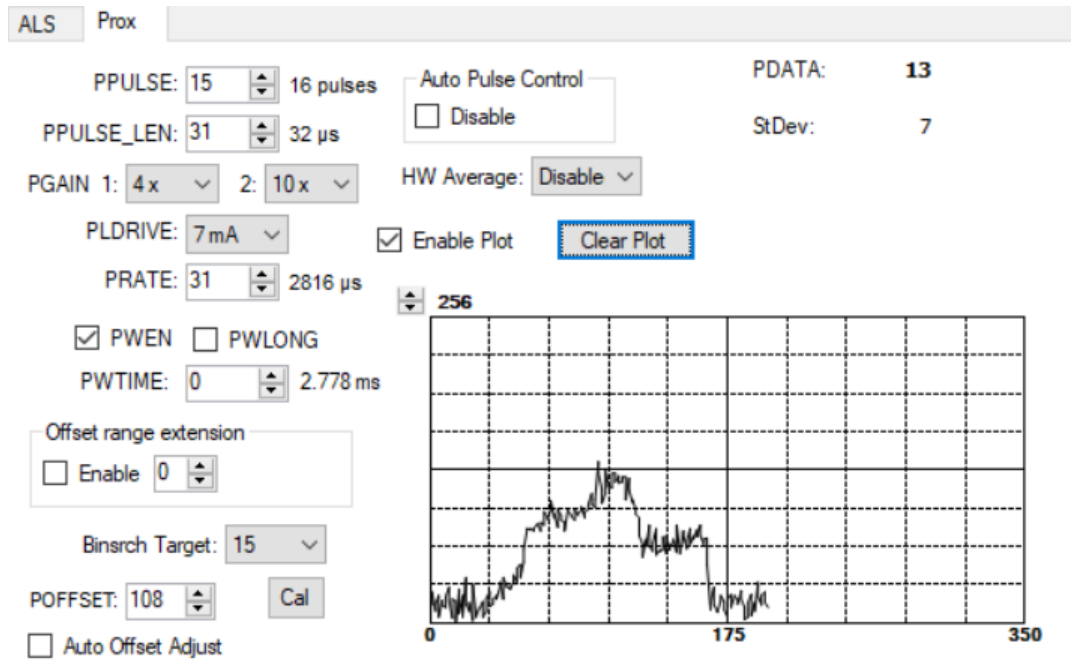
The scale of the Y-axis of the plot can be adjusted by clicking on the small up and down arrows at the top left corner of the plot. The scale can be set to any power of 2 from 64 through 65536.

Click the **Clear Plot** button to discard the current data and continue plotting the new data. Note if the Clear Plot button is clicked while the plot is disabled, the data is discarded, but the actual plot will not be updated until the plot function is re-enabled.

## 4.8 “Prox” Tab

The main portion of the screen contains a tab labeled Prox. The controls in this tab are divided into 3 sections, each performing a separate function.

Figure 11 :  
Prox Tab



### 4.8.1 Prox Controls

The left side of the Prox tab contains controls to set various Prox settings.

The **PPULSE** controls the number of pulses used for each prox cycle. The number of pulses is one more than the PULSE value and is displayed immediately to the right of the box.

The **PPULSE\_LEN** control sets the width of all IR LED pulses within the proximity cycle. Longer pulses result in increased proximity range and typically result in less electrical noise generated in the analog front end.

The **PGAIN1** and **PGAIN2** controls are pull-down menus that let you control the two gain stages of the proximity IR sensor. The PGAIN1 values are 1x, 2x, 4x and 8x. The PGAIN2 values are 2.5x, 5x and 10x.

The **PLDRIVE** control sets the drive strength of the IR LED current. The values range from 7mA to 10mA.

**PRATE** controls the duration of a single prox sample. The time is equal to  $(PRATE + 1) * 88\mu s$ . The time, in microseconds, is displayed immediately to the right of this control.

The **PWEN** checkbox controls the Prox Wait feature. When this box is checked, the values for PWTIME and PWLONG determine the time between Prox cycles. When this box is unchecked, there is no wait period between Prox cycles and the values of PWTIME and PWLONG are ignored.

The **PWTIME** control sets the time to wait between prox cycles. PWTIME can be adjusted in 2.778ms steps.

The **PWLONG** checkbox controls the PWTIME factor. When this box is checked, the wait time between Prox cycles increases by a factor of 12x.

The **Offset Range Extension** functionality has two controls. The **Enable** checkbox, turns the functionality on and off. The numeric control in this box sets the number of extension steps from Nominal to Nominal + 31 Steps.

The **Binsrch Target** control sets the target value for the Proximity offset calibration function.

The **POFFSET** controls shift PDATA to remove crosstalk from the proximity data. The values range from -255 to 255. This value can be set manually, or it can be set by the Proximity offset calibration.

The **Cal** button triggers the sensor's proximity offset calibration sequence. This function automatically selects a POFFSET to remove crosstalk from PDATA.

The **Auto Offset Adjust** checkbox enables the function that automatically decrements the POFFSET value any time the PDATA value is 0. When this function is active, manual changes to the POFFSET control are disabled, and the program will read and update the POFFSET value each time it reads the PDATA value.

The **Auto Pulse Control** function can be turned off with the **Disable** checkbox. This feature is used for hardware configurations with high crosstalk. When Auto Pulse Control is disabled, the range of the PDATA value is 0-1023

The **HW Average** control is a pulldown menu that defines the number of ADC samples collected and averaged during a cycle. The control can be set to "Disabled" or to 2, 4, 8, or 16 samples.

## 4.8.2 Prox Output Data

The top right corner of the Prox tab displays the output data. This data is continuously read. The polling interval is shown above the tab.

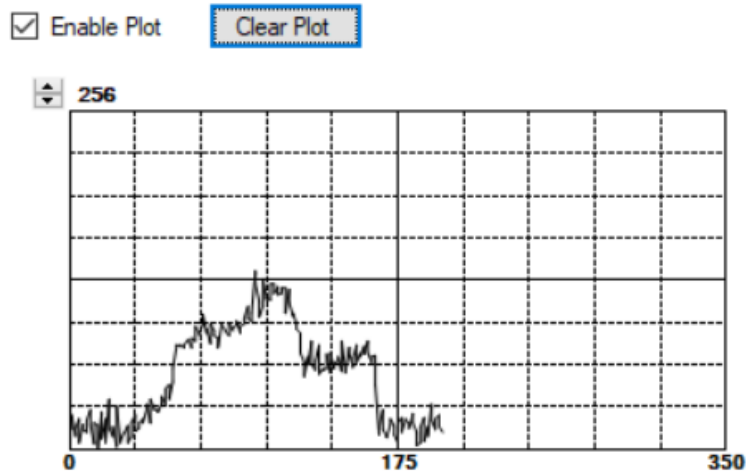
- **PDATA** displays the Proximity ADC channel data counts
- **StDev** displays the calculated standard deviation of the last 32 PDATA samples displayed on the screen.

## 4.8.3 Prox Data Plot

The remaining portion of the Prox tab is used to display a running plot of the collected PDATA values. The last 350 values are collected and plotted on the graph. As additional values are added, the old values will be deleted from the left side of the graph. To start the plotting function, check the **Enable Plot** checkbox.



Figure 12:  
Prox Data Plot



The scale of the Y-axis of the plot can be adjusted by clicking on the small up and down arrows at the top left corner of the plot. The scale can be set to any power of 2 from 16 to 16384.

Click the **Clear Plot** button to discard the current data and continue plotting the new data. Note if the Clear Plot button is clicked while the plot is disabled, the data is discarded, but the actual plot will not be updated until the plot function is re-enabled.

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## 5 Resources

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For additional information regarding the TMD2712, please refer to the datasheet. For information regarding the installation of the TMD2712 EVM host application software please refer to the TMD2712 EVM Quick Start Guide.

Designer's Notebooks dealing with various aspects of optical measurement and optical measurement applications are available. All content is available on the **ams** website [www.ams.com](http://www.ams.com).



**For further information, please refer to the following documents:**

- TMD2712 Datasheet
  - TMD2712 EVM Quick Start Guide (QSG)
  - TMD2712 EVM User's Guide (this document)
  - TMD2712 EVM Schematic Layout
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## 6 Revision Information

Changes from previous version to current revision v1-00	Page
Initial Release	

- Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
- Correction of typographical errors is not explicitly mentioned.

## 7 Legal Information

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